

Solving Exponential Equations Class Work

Objective: You will be able to solve exponential equations.

★ When you cannot find a common base, **Logarithms Come to Rescue!**

Example 1: Solve for x.

$$\begin{aligned} 4^{x-7} &= \log(7) \\ x \log(4) &= \log(7) \\ \frac{x \log(4)}{\log(4)} &= \frac{\log(7)}{\log(4)} \\ x &\approx 1.4037 \end{aligned}$$

Strategy:

- ① Take log of both sides
- ② move exponent to coefficient

Example 2: Solve for x.

$$\begin{aligned} -2 + 3(2)^{x-3} &= 29 \\ 3(2)^{x-3} &= 27 \\ 2^{x-3} &= 9 \\ (x-3) \log(2) &= \frac{\log(9)}{\log(2)} + 3 \\ x &\approx 6.1699 \end{aligned}$$

Strategy:

- ① Isolate exponential piece
- ② same as #1

Practice: Solve for the variable in each equation. Be sure to check for extraneous solutions. Complete all work on a blank sheet of paper.

1. $3^{-2h} = 16$

2. $5 - 6e^{5+2} = -25$ *****Remember, $\ln(e) = 1$**

3. $3 + (8)3^x = 11$

4. $1 - 3e^{2y-9} = -26$
 -0.3906
 5.5986

5. $\frac{3}{5}e^{4x} + \frac{3}{2} = 10$

6. $\frac{1}{3}e^{9x} - \frac{9}{2} = -2$
 0.2239

$$\begin{aligned} 5. \quad \frac{3}{5}e^{4x} + \frac{3}{2} &= 10 \xrightarrow{-\frac{3}{2}} \\ \frac{3}{5}e^{4x} &= \frac{17}{2} \xrightarrow{\cdot \frac{5}{3}} \\ e^{4x} &= \frac{85}{6} \\ \ln(e^{4x}) &= \ln\left(\frac{85}{6}\right) \quad \begin{aligned} & * \text{use } \ln \\ & \ln(e) = 1 \\ & \log_e(e) = 1 \end{aligned} \\ 4x &= \ln\left(\frac{85}{6}\right) \\ x &\approx 0.6629 \end{aligned}$$

$$\textcircled{1} 3^{-2h} = 16$$

$$\log(3^{-2h}) = \log(16)$$

$$\frac{-2h \log(3)}{\log(3)} = \frac{\log(16)}{\log(3)}$$

$$\frac{-2h}{-2} = \frac{2.5237}{-2}$$

$$h = -1.2619$$

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$$\textcircled{33} \log_2 x = -1$$

$$10^{-1} = 2x$$

$$\frac{1}{10} = \frac{2x}{1}$$

$$1 = 20x$$

$$x = \frac{1}{20}$$

$$\textcircled{37} \log_6 x - 3 = -4$$

$$\log_6 x = -1$$

$$10^{-1} = \frac{6x}{1}$$

$$\frac{1}{10} = \frac{6x}{1}$$

$$x = \frac{1}{60}$$

$$\textcircled{39} \frac{3}{2} \log x = \frac{15}{2}$$

$$\log x = \frac{5}{2}$$

$$10^{\frac{5}{2}} = x$$

$$x = \sqrt{10^5}$$

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☞ *Can you figure out how to solve these more intricate equations?! I think so!* ☺

7. $8^m = 3^{m-2}$

8. $2^{n+1} = 3^{7n}$

☞ *Can you create your own problems like this?! I think so!* ☺

Please do so on a blank sheet of paper, solve them, and hand them in!

Exit Slip Problems : Solve for the variable in each equation.

1. $18^{x-7} = 5$

2. $5 + e^{y-9} = 35$

Homework:

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#1 – 9 odd, 79, 81, 85, 91, 93, 95, 107, 108
and Throwback: #53-60, 84, 86, 88, and 94

Name: _____ Date: _____ Unit 7 Class Work

*Solutions are on the website! ☺